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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHRISTOPHER L. FLOWERS, WILLIAM PAUL RUSHING II
and SEUNGWON (CHRIS) SONG

Appeal 2008-3770
Application 10/617,376
Technology Center 1700

Decided: October 8, 2008

Before CATHERINE Q. TIMM, ROMULO H. DELMENDO, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1-13. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

I. BACKGROUND

The invention relates to treating plastic components of a washing chamber, such as a dishwasher or washing machine, with a fluorine-containing gas mixture in order to improve the stain resistance of plastic components. (Spec. 3, ll. 4-6). Claims 1, 7, 9, 12 and 13 are illustrative of the subject matter on appeal:

1. A method for improving stain resistance of a plastic washing machine component comprising:
placing the plastic washing machine component in a reaction chamber;
introducing a gas mixture containing fluorine and oxygen into the reaction chamber; and
reacting the gas mixture with the plastic washing machine component within the reaction chamber until the gas mixture modifies at least a surface layer of the plastic washing machine component to make the plastic washing machine component more resistant to staining.

7. The method according to claim 1, further comprising: penetrating the plastic component with the gas mixture to about 1000 angstroms.

9. The method according to claim 8, further comprising: employing a dishwasher tub as the plastic washing machine component.

12. The method according to claim 1, further comprising; maintaining the reaction chamber at a temperature of approximately 30-70°C.

13. The method according to claim 1, further comprising: establishing a pressure of approximately 0.1-0.9 atmospheres in the reaction chamber.

The Examiner relies on the following prior art references to show unpatentability:

McGinniss et al.	US 4,491,653	Jan. 1, 1985
Büschges et al.	US 5,882,728	Mar. 16, 1999
Seip et al.	US 2004/0171724 A1	Sep. 2, 2004

The Examiner maintains the following rejections:

1. Claims 1-6, 8-11, and 13 rejected under 35 U.S.C. § 103(a) as obvious over McGinniss et al. (hereinafter "McGinniss") in view of Seip et al. (hereinafter "Seip"); and

2. Claims 7 and 12 rejected under 35 U.S.C. § 103(a) as obvious over McGinniss in view of Seip and further in view of Büschges et al. (hereinafter "Büschges").

For the first rejection, Appellants provide arguments under separate headings for claims 1-6 and 8 as a group (App. Br. 4), claims 9-11 as a group (App. Br. 9), and claim 13 (App. Br. 10). For the second rejection, Appellants argue claim 7 (App. Br. 10) separately from claim 12 (App. Br. 12). Therefore, we decide the first ground of rejection on the basis of claims 1, 9, and 13. We consider claims 7 and 12 separately for the second ground of rejection. *See* 37 C.F.R. § 41.37(c)(1)(vii)("When multiple claims subject to the same ground of rejection are argued as a group by appellant, the Board may select a single claim from the group of claims that are argued together to decide the appeal with respect to the group of claims as to the ground of rejection on the basis of the selected claim alone.").

II. DISCUSSION

A. The Rejection of claims 1-6, 8-11, and 13 over McGinniss and Seip

i. Claims 1-6 and 8

With respect to claims 1-6 and 8, Appellants present two different arguments in support of patentability. First, Appellants argue that "nowhere

in Seip et al. is there any discussion or reference to providing any surface treatment for enhancing stain resistance, let alone any discussion or reference to fluorine." (App. Br. 5; *see* Reply Br. 3). According to Appellants, since Seip is directed to making a molded product, "such an arrangement is quite distinct from taking an already formed product and surface treating the same for stain resistance purposes." (App. Br. 5). Appellants suggest that the Examiner errs in "just [picking] out the fact that the composition [of Seip] can be used in making components for household appliances." (App. Br. 6). Appellants also note that "McGinniss et al. has absolutely no teaching that fluorine treatment would even work on the type of stains encountered in connection with a household appliance." (App. Br. 6). Appellants further note that "[m]erely stating that the combination of McGinniss et al. and Seip et al. is obvious due to the commercial benefit obtained is a conclusory statement" and that articulated reasoning for the combination is not provided by the Examiner. (App. Br. 7).

To this argument, the Examiner responds that McGinniss teaches a process "applicable to 'all types of polymeric solids'" and "specifically [teaches] that polypropylene substrates may be made stain resistant by the disclosed method." (Ans. 6). Further, the Examiner indicates that Seip is only relied upon to show "that it is desirable to make a species of polypropylene parts, namely washing machines and dishwashers, stain resistant." (Ans. 6-7). Thus, according to the Examiner, "it would have been *prima facie* obvious to one having ordinary skill to take the generic stain resistant polypropylene polymeric substrate taught by McGinniss et al. and to have used it as a stain resistant polypropylene polymeric part in a dishwasher and washing machine as suggested by Seip et al." (Ans. 6).

Next, Appellants provide an alternative argument that the subject matter of McGinniss teaches away from "introducing a gas mixture containing fluorine and oxygen" as claimed, since McGinniss "expressly discusses the disadvantages to the presence of oxygen" (App. Br. 8; *see also* Reply Br. 4). Appellants discuss the particular teachings against the use of oxygen found in McGinniss and the comparative examples (Example 4) of McGinniss using the process disclosed by U.S. Patent No. 4,020,223 to Dixon et al. (hereinafter "Dixon"), which includes the introduction of oxygen, to show that "McGinniss et al. is specifically outlining the downside of using oxygen to treat solid components." (App. Br. 8). Appellants point out that "poor" stain resistance occurs in the comparative examples when oxygen is present in the quantities disclosed in Dixon. (Reply Br. 3).

To this second argument, the Examiner responds that McGinniss only teaches that the oxygen is "restricted to an amount such that substantially no oxidation of the polymeric surface occurs," and that "the use of a certain amount of oxygen during the fluorination process is within the clear teaching of McGinniss et al." (Ans. 7). The Examiner also notes that "the appealed claims do not recite any particular amount or range of oxygen." (Ans. 7).

The issues on appeal arising from the contentions of Appellants and the Examiner are: (i) have Appellants demonstrated that the Examiner reversibly erred in determining that it would have been obvious to one of ordinary skill in the art to use a fluorination process in a dishwasher or washing machine component based on the teachings of McGinniss and Seip; and (ii) have Appellants rebutted a prima facie case of obviousness by demonstrating that McGinniss teaches away from the claimed invention? We answer both of these questions in the negative.

The evidence of record supports the following Findings of Fact (FF):

1. McGinniss is directed to "a method for fluorinating the surface of a polymeric solid for improving a surface property of such solid while substantially maintaining the bulk physical properties of said solid." (McGinniss, col. 2, ll. 22-25).

2. According to McGinniss, the method includes "contacting the polymeric solid with dilute fluorine gas at a temperature not substantially above about room temperature and at a pressure not substantially above about one atmosphere for a time adequate to partially fluorinate the solid surface by forming stable fluorocarbon groups." (McGinniss, col. 2, ll. 25-31).

3. Seip teaches that

> [t]he polyolefin compositions according to the current invention may comprise propylene homopolymers or propylene/ethylene impact copolymers, depending upon the application in which the composition is to be used. Impact copolymers are preferred in such applications as dishwashers, washing machines, refrigerators and other appliances that may experience impacts over a wide temperature range.

(Seip, ¶ 8).

4. Appellants' Specification states that "[t]ypically, interior walls of a dishwasher tub are formed of plastic, generally polypropylene." (Spec. 1, ll. 11-12).

5. McGinniss teaches that "[s]urface properties of polymeric solids which may be improved according to the precepts of the present invention include, for example, providing improved dirt resistance [and] better washability." (McGinniss, col. 2, ll. 61-64).

6. McGinniss teaches that polypropylene is one type of polymeric solid that may be provided stain resistance by the fluorination process taught by McGinniss. (McGinniss, col. 10, ll. 49-50; cols. 9, ll. 62-65 (Table 4A); cols. 11, ll. 15-17 (Table 4B), col. 12, ll. 32-38 (Table 5)).

7. McGinniss teaches that "some polymeric solids while providing good tensile strength, may become easily soiled and scratched, while other polymeric solids of good optical transmissivity can become easily soiled and are resistant to cleaning." (McGinniss, col. 1, ll. 39-43).

8. McGinniss characterizes Dixon as proposing "to fluorinate polyolefin and polyacrylonitrile fiber form by treating such fiber form with elemental fluorine in the presence of low amounts of oxygen." (McGinniss, col. 2, ll. 2-6; *see also* col. 10, ll. 28-30).

9. McGinniss teaches that "[t]he Dixon fluorination process utilizes a controlled amount of fluorine and air (oxygen) in a ratio of 1:5 O_2/F_2 or less with F_2 ranging from 1-5% and O_2 ranging from 0.2-5%." (McGinniss, col. 10, ll. 30-33).

10. McGinniss describes that oxidation of the polymeric solid surface causes the instability of fluorine group formation (i.e., that they can be easily removed by water washing) and inhibits fluorine penetration into a substrate for formation of fluorocarbon groups. (McGinniss, col. 3, 60 to col. 4, l. 34).

11. McGinniss shows the benefits, including yielding higher surface fluorination concentrations and increased stability of surface fluorine to water washing, of restricting oxygen content over that taught by Dixon. (McGinniss, col. 11, ll. 25-35).

12. McGinniss teaches improvements in contact angle (i.e., the difference in the angle of incidence between the substrate and one drop of water initially and after 5 minutes), stain resistance, and scratch resistance by the restriction of oxygen over that taught by Dixon. (McGinniss, col. 11, l. 40 to col. 13, l. 3).

13. McGinniss teaches that "[t]he proportion of oxygen-providing compounds (e.g., molecular oxygen or air) present during the fluorination process is restricted to an amount such that substantially no oxidation of the polymeric solid surface occurs." (McGinniss, col. 2, ll. 36-40).

14. McGinniss teaches that "[t]he proportion of oxygen or other oxygen-providing compound present during the fluorination process, then, is defined functionally in that substantially no oxidation of the polymeric surface results by that proportion of oxygen present." (McGinniss, col. 4, ll. 28-34).

15. McGinniss teaches that "the presence of oxygen, for example in the form of air, even at nominally low proportions will cause significant oxidation of the polymeric solid surface." (McGinniss, col. 3, ll. 63-66).

16. McGinniss teaches that the comparative examples, which are based on the teachings of Dixon and include a high oxygen content (i.e., 3 % O_2 and 1.4 % O_2 as compared with 2.4 % F_2), exhibit "poor" stain resistance. (McGinniss, col. 12, ll. 37-38; col. 10, ll. 37-45).

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727,

1734 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S. Ct. at 1734 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.").

McGinniss is directed to using a fluorination process to provide stain resistance to polymeric solid articles, including polypropylene solid articles. (FF 1-2 and 5-6). Seip, as well as admissions in Appellants' Specification, provide sufficient evidence that polypropylene was well known in the art at the time of the invention to be a material commonly used in washing machine and dishwasher components. (FF 3 and 4). We determine that one of ordinary skill in the art, knowing that dishwasher and washing machine parts are made from polypropylene, would recognize that the process taught by McGinniss would improve stain resistance of polypropylene dishwasher and washing machine parts to the extent that it improves stain resistance of other polypropylene solid articles. Thus, the Examiner has established that it would have been obvious to use the process taught by McGinniss on polypropylene dishwasher and washing machine components. *See KSR*, 127 S. Ct. at 1740 ("if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond that person's skill.").

Further, McGinniss teaches that polymeric solids "may become easily soiled and scratched" and "can become easily soiled and are resistant to cleaning." (FF 7). Thus, one of ordinary skill in the art would expect that the fluorination process of McGinniss would have improved the stain resistance of untreated polypropylene dishwasher components to the extent suggested by McGinniss. Since claim 1 does not call for improved resistance to any particular stains and does not identify resistance to food stains, in particular, as a required feature of the claim (*See* Claim 1), we need not find any further rationale for one of ordinary skill in the art to use the fluorination process of McGinniss on conventional polypropylene dishwasher and washing machine components. *KSR*, 127 S. Ct. at 1742 ("[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.").

Therefore, the Examiner did not reversibly err in determining that it would have been obvious to one of ordinary skill in the art to use a fluorination process in a dishwasher or washing machine component based on the teachings of McGinniss and Seip.

We cannot agree that McGinniss "teaches away" from the claimed invention to the extent that there is no prima facie case of obviousness. *In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir. 1997)("A *prima facie* case of obviousness can be rebutted if the applicant ... can show 'that the art in any material respect taught away' from the claimed invention.")(*quoting In re Malagari*, 499 F.2d 1297, 1303 (CCPA 1974)).

We note that claim 1 does not recite a minimum or maximum concentration of oxygen that may be introduced into the reaction chamber.

(*See* Claim 1). Thus, one of ordinary skill in the art would have understood that claim 1 would be satisfied by the presence of any amount of oxygen in a fluorine-containing gas mixture.

McGinniss clearly discloses that it was well known in the art to use a gas mixture of fluorine and oxygen in a fluorination process by its reference and use of comparative examples on the basis of the teachings of Dixon. (FF 8 and 9). McGinniss emphasizes the benefits of restricting the presence of oxygen to an amount such that substantially no oxidation of the polymeric surface occurs, particularly less than the 0.2% concentration or 1:5 O_2/F_2 ratio allowed for by the teachings of Dixon. (FF 10-12).

However, we find that McGinniss does not explicitly reject the presence of any and all amounts of oxygen. (*See* McGinniss). Rather, McGinniss affirmatively recites a concentration of oxygen functionally, i.e., an amount "such that substantially no oxidation occurs." (FF 13-14). Thus, McGinniss established *prima facie* that oxygen may be introduced, as recited in clam 1, provided that it is in an amount "such that substantially no oxidation of the polymeric solid surface occurs." Even though McGinniss teaches that significant oxidation occurs at "nominal low proportions" of oxygen (FF 15), the broadest reading of McGinniss allows for oxygen to be introduced at a high enough concentration that some oxidation may occur provided that the oxidation is not substantial. (FF 13-14). As such, McGinniss does not teach away from the use of oxygen in a fluorine-containing gas mixture.

Further, "[a]lthough a reference that teaches away is a significant factor to be considered in determining unobviousness, the nature of the teaching is highly relevant, and must be weighed in substance." *Gurley*, 27

F.3d at 552-53. Claim 1 recites "improving stain resistance of a plastic washing machine component" without any statement regarding to what extent to which the stain resistance should be improved. (Claim 1). While McGinniss teaches that the comparative examples based on the teachings of Dixon, which use a higher percentage of oxygen (3 % and 1.4 % by weight), exhibit "poor" stain resistance (FF 16), nothing in the teachings of McGinniss suggest that the process of Dixon, which encompasses levels of oxygen down to 0.2 wt.%, exhibits *no* stain resistance at all. (*See* McGinniss; FF 9, 16). Therefore, one of ordinary skill in the art, having the teachings of McGinniss, would have understood that stain resistance is still improved using a fluorination process, even with the presence of oxygen, over no fluorine treatment at all. Despite the fact that McGinniss shows Dixon to teach an inferior process, McGinniss does not teach that the process taught by Dixon is inoperable for stain resistance and thus does not teach away from the use of Dixon to achieve even minor amounts of improved stain resistance. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)("In general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.") Our reviewing court has established that a claimed invention does not become patentable simply because it has been described as somewhat inferior to another invention for the same use. *Gurley*, 27 F.3d at 552-53; *see also In re Larson*, 340 F.2d 965, 969 (CCPA 1965)("it would seem a matter of obvious choice to eliminate [a superior feature] and the function it serves."). Additionally, Appellants have provided no evidence that Appellants' results are better than the "poor" results expected when oxygen is present in the amount taught by

Dixon based on the teachings of McGinniss. *KSR*, 127 S. Ct. at 1739 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

Therefore, Appellants have not effectively rebutted a prima facie case of obviousness and have not successfully demonstrated that McGinniss teaches away from the claimed invention.

ii. Claim 9

Turning to claim 9, Appellants argue that "there is absolutely no teaching [in either McGinniss or Seip] regarding the specific [dishwasher] components recited in [claims 9-11]." (App. Br. 9; *see* Reply Br. 5). Appellants argue that "[t]he Examiner has not presented any comments or evidence of any reasonable likelihood of success at arriving at the present invention with the teachings in combination." (App. Br. 9). Particularly, Appellants ask "[h]ow do we even know from the references that either the fluorine treatment of McGinniss et al. or the composition of Seip et al. would be contemplated for or could even provide requisite stain resistance to these specific components?" (App. Br. 9).

The Examiner responds that Seip teaches polypropylene parts are used in dishwashers and washing machines and that it is desirable for these parts to resist staining at high temperatures and in the presence of food. (Ans. 8). The Examiner also notes that "Seip et al. refer to ketchup, a tomato based food, in the Figures." (Ans. 8). The Examiner argues that "[t]he claimed specific parts of the washing machine and dishwasher are suggested and at least implied by Seip et al. since the claimed plastic parts are the

conventional plastic parts found inside washing machines and dishwashers," as would be recognized by one having ordinary skill in the art. (Ans. 8).

Another issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that it would have been obvious to one of ordinary skill in the art to utilize the fluorination process taught by McGinniss on specific dishwasher components, particularly the dishwasher tub recited in claim 9, given the teachings of Seip? We answer this question in the negative.

The evidence of record supports the following additional Finding of Fact (FF):

17. Appellants' Specification teaches that "[t]ypically, interior walls of a dishwasher tub are formed of plastic, generally polypropylene. In addition, the use of plastic for the internal components of dishwashers, such as spray arms, is becoming increasingly popular due to the relatively low cost, lightweight, and flexibility of design offered by plastic." (Spec. 1, ll. 11-15).

As discussed above, we have chosen claim 9 to decide the appeal with respect to the rejection of claims 9-11. *See* 37 C.F.R. § 41.37(c)(1)(vii). Claim 9 recites "employing a dishwasher tub as the plastic washing machine component." (Claim 9). Appellants' Specification admits that it was well known in the art to fabricate dishwasher tubs and spray arms from plastic, particularly polypropylene. (FF 17). Further, we have discussed above that one of ordinary skill in the art, knowing that dishwasher parts are made from polypropylene, would recognize that the process taught by McGinniss would improve stain resistance of polypropylene dishwasher parts. Based on the

same rationale, we can also conclude that it would have been obvious to one of ordinary skill in the art to apply this understanding to any dishwasher parts known to be made from polypropylene, including a dishwasher tub. We also find that Appellants provide no evidence that a dishwasher tub, or any of the particular dishwasher components claimed, would be impossible or undesirable to treat with a fluorination process taught by McGinniss. (*See* App. Br.).

Therefore, we determine that the Examiner did not reversibly err in determining that it would have been obvious to one of ordinary skill in the art to utilize the fluorination process taught by McGinniss on specific dishwasher components, particularly the dishwasher tub recited in claim 9, given the teachings of Seip.

iii. Claim 13

Regarding claim 13, Appellants argue that McGinniss' teaching that "the fluorine treatment is performed 'at a pressure not substantially above about one atmosphere'" is properly interpreted to mean "that the pressure in the reaction chamber is above one atmosphere, but just not substantially above about one atmosphere" and that one atmosphere is outside of the claimed pressure range. (App. Br. 10; *see* Reply Br. 6). Appellants also point to the example, which, according to Appellants, teaches that "additional nitrogen was charged to establish 1 atmosphere pressure in the cell" prior to the reaction taking place, to show that McGinniss only teaches that the reaction occurs outside of the claimed pressure range. (Reply. Br. 5).

The Examiner responds that McGinniss provides "an unambiguous statement…that 'a total pressure of 1 atmosphere or less' is employed in the process." (Ans. 9). The Examiner also argues that "the reaction pressure would have been readily optimized as a result effective variable, thereby also rendering the claim *prima facie* obvious absent new or unexpected results." (Ans. 9).

Another issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that the pressure range recited in claim 13 would have been obvious to one of ordinary skill in the art having the teachings of McGinniss and Seip? We answer this question in the negative.

The evidence of record supports the following additional Findings of Fact (FF):

18. McGinniss teaches that "[f]luorination reactions were carried out in a 1 liter or 2 liter reaction cell under very dilute fluorination conditions at room temperature (ca. 21° C.) and at a total pressure of 1 atmosphere or less." (McGinniss, col. 7, ll. 37-40).

19. McGinniss teaches that

> [t]ypical dilute fluorination for the 1 liter cell was practiced as follows:
> (1) the solid polymer sample was placed into the cell and the cell evacuated to about 1.8 mm of H_2O (about 25 inches of water) with a water aspirator or to 1-2 mm of H_2O (about 30 inches of water) with a vacuum pump;
> (2) the evacuated cell was filled to 50% of its volume with N_2 (O_2 free);
> (3) the partially pressurized cell then was filled with the dilute fluorinating gas to 17% of the cell volume, then additional N_2 was charged to

> establish 1 atmosphere in the cell, and the cell held at room temperature for 1-60 minutes depending upon the degree of surface fluorination desired; and
> (4) the cell was evacuated and the surface fluorinated sample was removed. The total fluorine content in the cell was about 2.55%.

(McGinniss, col. 7, l. 43-col. 8, l. 11).

Claim 13 recites "establishing a pressure of approximately 0.1-0.9 atmospheres in the reaction chamber." (Claim 13). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including non-preferred embodiments. *Merck & Co. Inc., v. Biocraft Laboratories, Inc.* 874 F.2d 804, 807 (Fed. Cir. 1989). Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or non-preferred embodiments. *In re Susi,* 440 F.2d 442, 446 n.3 (CCPA 1971). Thus, even though McGinniss includes some examples in which the fluorination reaction takes place at one atmosphere (FF 19), the disclosure itself includes a broader teaching that the reaction may occur at pressures of one atmosphere or less. (FF 2 and 18).

From the teachings of McGinniss, one of ordinary skill in the art would have a reasonable expectation of success that the reaction could take place at any pressure less than one atmosphere, including at the claimed pressure range of 0.1 to 0.9 atmospheres, and merely had to verify that expectation. *See Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1367–369 (Fed. Cir. 2007) (simply because the properties of a compound must be verified through testing does not mean that the compound satisfies the test for patentability "since the expectation of success need only be reasonable, not absolute."). Thus, a *prima facie* case of obviousness has been established,

and the burden is shifted to Appellants to establish nonobviousness through unexpected results or other evidence of secondary considerations. *See In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990); *see also In re Huang*, 100 F.3d 135, 139 (Fed. Cir. 1996) (holding that Appellants' claim will "not be patentable if the modification was within the capabilities of one skilled in the art, unless the claimed ranges 'produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art.'")(*quoting In re Aller*, 220 F.2d 454, 456 (C.C.P.A. 1955)). Appellants provided no convincing evidence of unexpected results. Therefore, the Examiner did not reversibly erred in determining, based on the totality of the evidence, that the pressure range recited in claim 13 would have been obvious to one of ordinary skill in the art having the teachings of McGinniss and Seip.

B. The Rejection of claims 7 and 12 over McGinniss, Seip, and Büschges

i. Claim 7

Appellants argue that the Examiner has not provided a sufficient reason "to modify McGinniss et al. with Büschges et al.," since Büschges "sets forth a process in which a polymer is subjected to a four stage process" of "different pressures, temperatures and fluorine concentrations for different time periods." (App. Br. 11). Appellants also indicate that the Examiner has not discussed "why one of ordinary skill in the art would look to use a fuel mixture barrier as set forth by Büschges et al. to combine with the McGinniss et al./ Seip et al. arrangement." (App. Br. 11; *see* Reply Br. 6).

The Examiner responds that Büschges teaches a thickness range of 0.01 to 100 microns, that 0.1 microns equals 1000 angstroms, and that Büschges achieves this depth by processing in a temperature range of 20-80ºC. (Ans. 10). Thus, the Examiner argues that it would have been obvious to one of ordinary skill in the art "to have modified the polypropylene fluorination treatment disclosed by McGinniss et al. and to have provided the depth of fluorination taught by Buschges et al.'s polypropylene fluorination treatment in order to further improve the barrier properties of McGinniss et al.'s polypropylene substrate" and "to have employed the temperatures disclosed by Buschges et al. in the method of McGinniss et al. for the purpose of achieving Buschges et al.'s depth of fluorination in McGinniss et al's substrate." (Ans. 10).

Another issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that the gas penetration depth of 1000 angstroms, as recited in claim 7, would have been obvious to one of ordinary skill in the art having the teachings of McGinniss, Seip and Büschges? We answer this question in the negative.

The evidence of record supports the following additional Findings of Fact (FF):

20. McGinniss teaches that "at least for a certain distance within the polymeric solid, e.g., about 100 A or thereabouts, it is desirable that the fluorination penetrate into the substrate to form some fluorocarbon groups." (McGinniss, col. 4, ll. 18-21).

21. Büschges teaches that "[t]he thickness of the fluorinated layer was determined by the transmission electron microscopy method and is from 0.01 to 100 μm," which equates to 100 to 1 million angstroms.

22. Büschges teaches a multi-stage process in which a polymeric article is exposed to fluorine-containing gas in which any of pressure, temperature, reaction time, type of fluorine containing gas, and fluorine concentration can be altered between stages. (Büschges, col. 2, l. 53-col. 3, l. 28; col. 5, ll. 1-45).

23. Büschges teaches a minimum total reaction time of 45 minutes and a maximum reaction time of over 200 minutes. (Büschges, col. 2, l. 53-col. 3, l. 28).

Claim 7 recites "penetrating the plastic component with the gas mixture to about 1000 angstroms." (Claim 7). Although McGinniss teaches, as an example, that it is desirable for the fluorine to penetrate to a depth of 100 angstroms or thereabout (FF 20), we look to the overall teachings of McGinniss, rather than just the examples. *In re Susi*, 440 F.2d at 446 n.3. McGinniss' description that "the cell is held…for 1-60 minutes depending upon the degree of surface fluorination desired" suggests that "the degree of surface fluorination" is a variable which can be affected by the reaction time. (FF 19). If the fluorine penetration depth can be altered depending upon reaction time, we find that fluorine penetration depth is a result effective variable. Optimization of a variable which is recognized in the prior art to be a result effective variable would ordinarily be within the skill in the art. *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980); *see also In re Aller*, 220 F.2d 454, 456 (CCPA 1955) ("where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the

optimum or workable ranges by routine experimentation."). Thus, a *prima facie* case of obviousness has been established, and the burden is shifted to Appellants to establish nonobviousness through unexpected results or other evidence of secondary considerations. *Woodruff*, 919 F.2d at 1578; *Huang*, 100 F.3d at 139. Appellants provide no evidence of unexpected results or secondary considerations stemming from this particular fluorination depth.

In further support of our finding that fluorine penetration depth is a result effective variable, we note that Büschges teaches a wide range of penetration depths, i.e., from 100 to 1 million angstroms. (FF 21). Even though Büschges teaches a multi-stage fluorination process, that is different from the single stage process taught by McGinniss, Büschges similarly exposes a polymeric material to a fluorine-containing gas, where not only reaction time, but also pressure, temperature, type of fluorine-containing gas, and concentration of fluorine are variable from stage to stage. (FF 22). In particular, the total reaction times taught by Büschges can vary from 45 minutes to over 200 hours, which accounts for the wide range of fluorine penetration depths provided by the fluorination process taught by Büschges. (FF 23).

Therefore, the Examiner did not reversibly err in determining that the gas penetration depth of 1000 angstroms, as recited in claim 7, would have been obvious to one of ordinary skill in the art having the teachings of McGinniss, Seip and Büschges.

ii. Claim 12

As with claim 7 above, Appellants argue that "[o]ne of ordinary skill in the art would not look to Büschges et al. and, more particularly, isolated

parameters of the process of Büschges et al., to surface treat an entirely different product for an entirely different reason." (App. Br. 12). Appellants also argue that McGinniss teaches a "room temperature" reaction which is "in [the] order of 18-23ºC, not 32-70ºC as set forth in claim 12." (Reply Br. 6).

The Examiner responds that McGinniss' teaching of the reaction occurring at "room temperature" is sufficient to render the lower limit of the claimed range, i.e., approximately 30ºC, prima facie obvious. (Ans. 9). The Examiner also argues that "the reaction temperature would have been readily optimized as a result effective variable in view of McGinniss et al., thereby also rendering claim 12 *prima facie* obvious absent new or unexpected results." (Ans. 9).

Another issue on appeal arising from the contentions of Appellants and the Examiner is: have Appellants demonstrated that the Examiner reversibly erred in determining that the temperature range recited in claim 12 would have been obvious to one of ordinary skill in the art having the teachings of McGinniss, Seip and Büschges? We answer this question in the negative.

The evidence of record supports the following Findings of Fact (FF):

24. McGinniss teaches that "the polymeric solid of choice, proportion of fluorine gas, reaction temperature and reaction pressure are variables which necessarily will impact the fluorination reaction time which should be practiced." (McGinniss, col. 4, l. 66 to col. 5, l. 2).

Claim 12 recites "maintaining the reaction chamber at a temperature of approximately 30-70ºC." (Claim 12). Although McGinniss teaches, as an example, that it is desirable for the reaction to occur at room temperature

(FF 2 and 19), we look to the overall teaching of McGinniss, rather than just the examples or preferred embodiments thereof. *In re Susi*, 440 F.2d at 446 n.3. We find that McGinniss also teaches that reaction temperature is a variable that impacts the desired reaction time. (FF 24). Thus, we find the reaction temperature to be a result effective variable, which can be optimized through routine experimentation, and thus would have been obvious to one of ordinary skill in the art. *Boesch*, 617 F.2d at 276; *Aller*, 220 F.2d at 456. Again, Appellants provide no evidence of unexpected results or secondary considerations stemming from the use of this particular reaction temperature. *Woodruff*, 919 F.2d at 1578; *Huang*, 100 F.3d at 139. Therefore, we determine that the Examiner did not reversibly err in determining that the temperature range recited in claim 12 would have been obvious to one of ordinary skill in the art having the teachings of McGinniss, Seip and Büschges.

III. CONCLUSION

Based on the totality of record, including due consideration of the Appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness within the meaning of 35 U.S.C. § 103. Therefore, we reach the following conclusions:

(1) We sustain the Examiner's rejection of claims 1-6, 8-11, and 13 under 35 U.S.C. § 103(a) as obvious over McGinniss in view of Seip; and

(2) We sustain the Examiner's rejection of claims 7 and 12 under 35 U.S.C. § 103(a) as obvious over McGinniss in view of Seip and further in view of Büschges.

IV. DECISION

The decision of the Examiner is affirmed.

V. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal maybe extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

tc

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